

Transportation Air Quality and MOVES Training

Module 3: MOVES Critical Inputs

Note: This material is part of a five module training course prepared by the Texas A&M Transportation Institute (TTI) for the Texas Department of Transportation. Please review the training description document for further details and for TTI contact information

Objective

Regional Emissions Estimation Process

MOVES Rates Mode

Critical Inputs for Regional Analyses

Defaults and Local Inputs

Class Exercises

MOVES Inputs-All

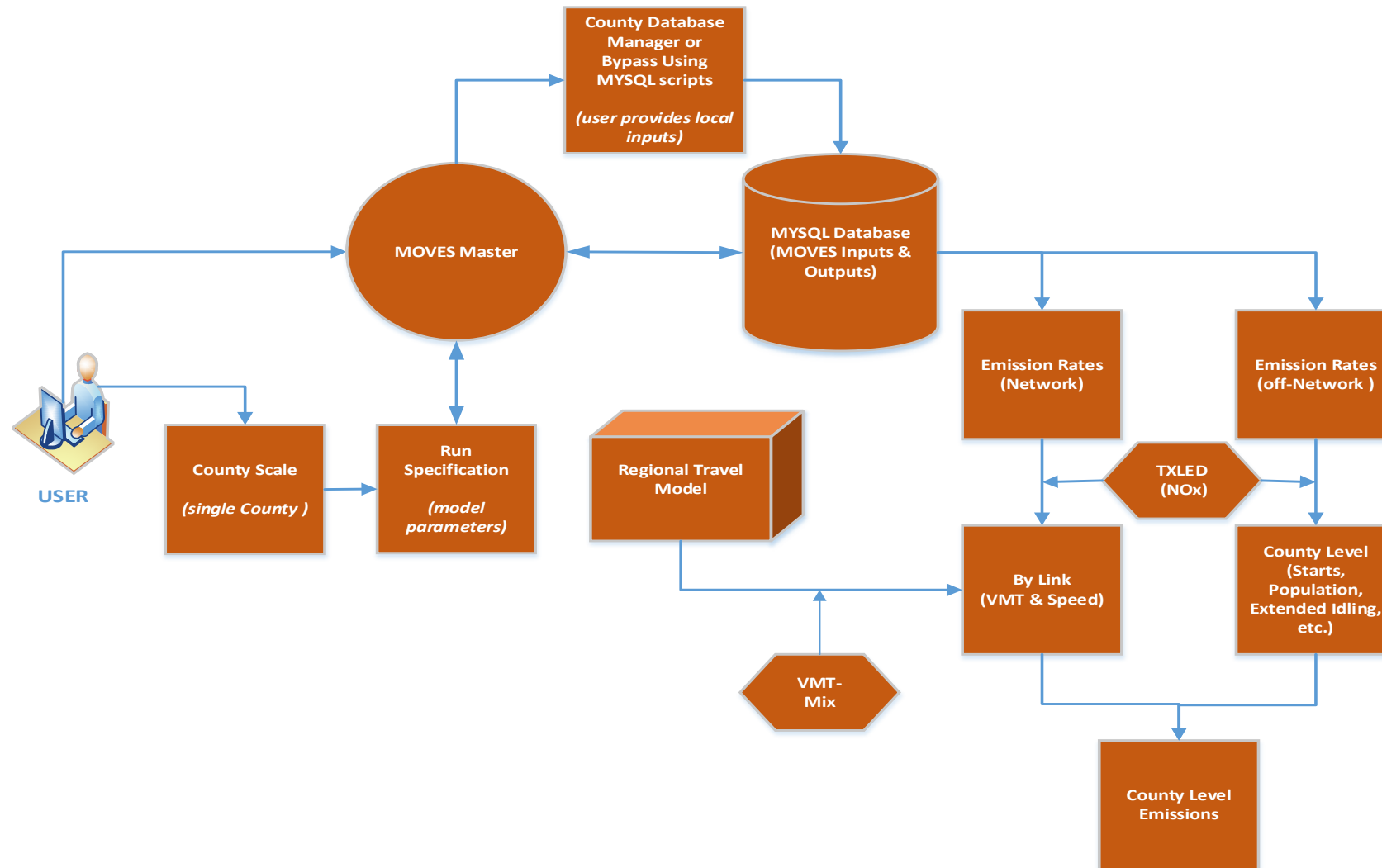
Data Type	MOVES Inputs*	Rates Mode	Inventory Mode
Speed Distribution	avgspeeddistribution	Default/Local	Local
Fuel	fuelformulation, fuelsupply, fuelusagefraction, AVFT	Local	Local
Hotelling	hotellingactivitydistribution hotellinghours	Optional	Optional
Vehicle Type VMT	hpmsvtypeyear, hourvmtfraction, dayvmtfraction, monthvmtfraction	Default/Local	Local
Road Type Distribution	roadtypedistribution	Default/Local	Local
IM Program	imcoverage	Local	Optional
Starts	starts, startshourfraction, startshouradjust, startspersday, startssourcetypefraction, importstartopmodedistribution	Optional	Local
Ramp Fraction	roadtype	Local	Local
Age Distribution	sourcetypeagedistribution	Local	Local
Source Type Population	sourcetypeyear	Default/Local	Local
Meteorology Data	zonemonthhour	Local	Optional
Retrofit Data	onroadretrofit	Optional	Optional

* Tables produced using MOVES County Data Manager (CDM).

CRITICAL INPUTS

Rates Mode Run

Regional Emissions Estimation Process



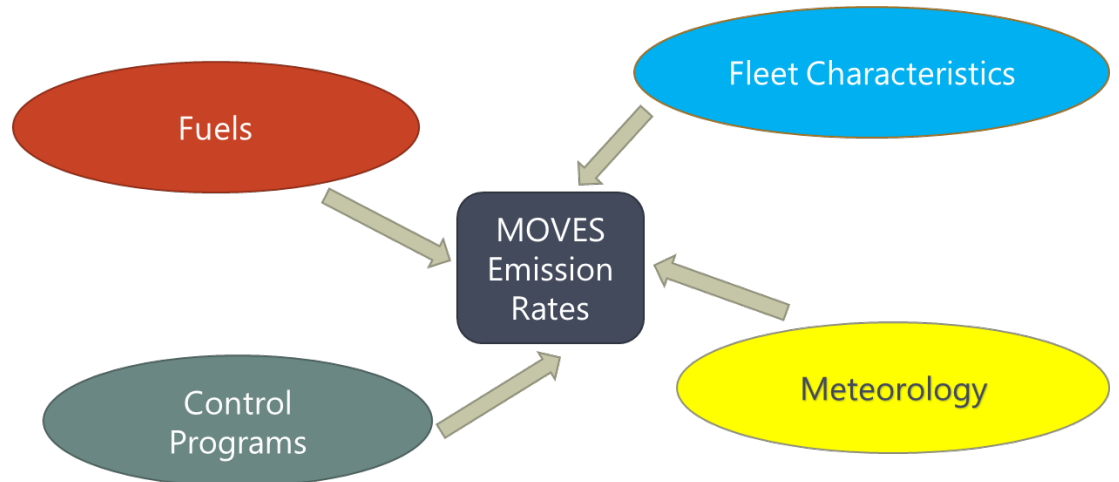
MOVES Inputs- Rates Mode

Critical

- Fleet characteristics
- Fuels
- Meteorology
- Control programs

Non-Critical

- Activity based
 - VMT, population & speed distribution, etc.



** Default activity okay for MOVES rates-per-activity emission rates in some cases **

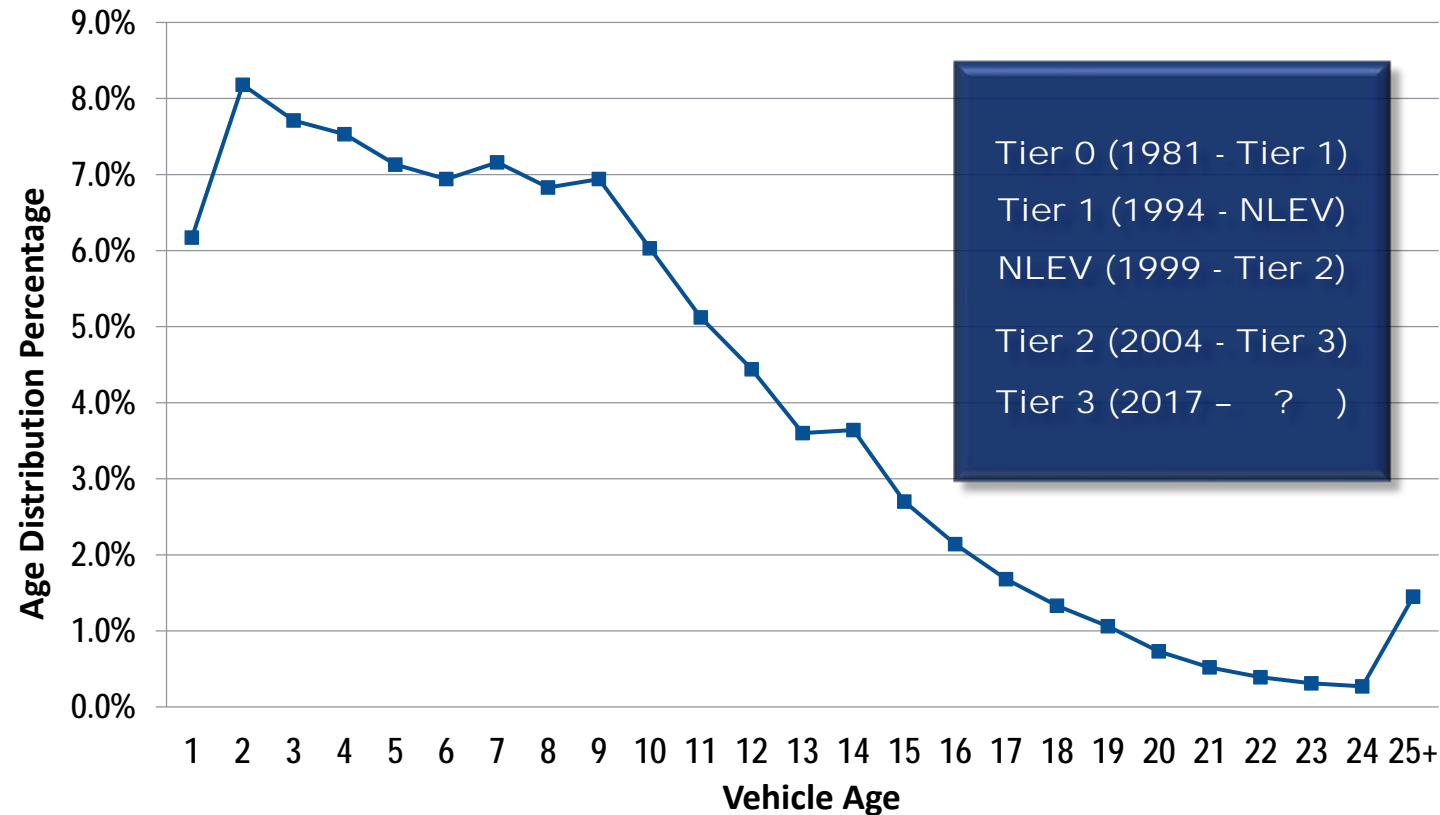
MOVES Inputs – Fleet Characteristics

SUT Age Distributions (sourcetypeagedistribution)

- Fleet age distribution is important - newer vehicles usually emit less than older ones
- Fleet average age can vary from county to county and year to year
- DMV county vehicle registrations are usually used
 - Mid Year
- Larger area aggregations may be used (e.g., region for short-haul trucks, statewide for long-haul trucks)
- MOVES defaults may be used in the absence of local data
- Age distribution is not changed for future years

MOVES Inputs – Fleet Characteristics Cont'd

SUT Age Distributions Example



sourceTypeID	yearID	ageID	ageFraction
11	2010	0	0.029595878
11	2010	1	0.098411617
11	2010	2	0.110931312
11	2010	3	0.138696078
11	2010	4	0.115743304
11	2010	5	0.084571818
11	2010	6	0.056551548
11	2010	7	0.067325299
11	2010	8	0.053442916

Note: For each vehicle type it should sum to 1.0

MOVES Inputs – Fleet Characteristics

Alternative Vehicle Fuels and Engine Technologies (AVFT)

- Fleet distribution by fuel type and engine technology by model year
- Discussed next with fuels inputs

MOVES Inputs – Fuels

Fuelsupply

- Available fuel formulations (IDs) by year, month, and region, and their market shares (which, for multiple fuel sub-types, must sum to 1.0 within each fuel type).

Fuelformulation

- Defines the fuel properties (e.g., RVP, sulfur content, ethanol volume) of a fuel sub-type.

Fuelusagefraction

- Specifies flex-fueled vehicle (FFV) frequency of E-85 use versus gasoline (fractions that sum to 1.0 for each year).

AVFT

- Specifies mix of fuel type capabilities (e.g., E-85 and gasoline for FFVs) by model year and source type.

Snippet

- MOVES calculates the fuel adjustments based on the fuel properties specified in the fuelformulation table
- From fuelsupply table, MOVES uses marketshare field values to weight final fuel adjustment factors by fuel type
- Emission rates are applied to appropriate activity (by fuel type) defined through the fuelusage and avft tables

MOVES Inputs – Fuels (Fuel Supply)

For a specified month and year, identifies the market shares of fuel formulations (for one or multiple subtypes [that sum to 1.0]) within fuel types, by “fuel region”

The MOVES regioncounty table lists counties by region

San Antonio TDM counties involve two fuel regions

fuelRegionID	fuelYearID	monthGroupID	fuelFormulationID	marketShare	marketShareCV
178010000	2010	7	11702	1	NULL
178010000	2010	7	30006	1	NULL

MOVES Inputs – Fuels (Fuel Formulation)

Fuel formulations are identified by fuelformulation ID

Existing IDs may be used or new ones created, but it is best use IDs uniquely different from MOVES defaults

Generally, actual local fuel survey data, if available, could be used for historical year fuelformulation estimation

For future year analyses, fuelformulations from latest available survey could be used with adjustments made where needed for future year regulatory standards (e.g., sulfur, RVP, benzene)

MOVES defaults could be used in absence of local data

fuelFormulationID	11702	30006
fuelSubtypeID	12	20
RVP	7.39	0
sulfurLevel	29.22	5.72
ETOHVolume	9.78	0
MTBEVolume	0	0
ETBEVolume	0	0
TAMEVolume	0	0
aromaticContent	25.22	0
olefinContent	11.09	0
benzeneContent	0.95	0
e200	49.02	0
e300	81.42	0
volToWtPercentOxy	0.3653	0
BioDieselEsterVolume	NULL	NULL
CetaneIndex	NULL	NULL
PAHContent	NULL	NULL
T50	204.98	0
T90	334.64	0

MOVES Inputs – Fuels (AVFT)

Fuel types and vehicle engine technology proportions by model year

Previously known as “Diesel Sales Fractions” (MOBILE6)

MOVES defaults include: gasoline, diesel, CNG (transit bus), E-85 (for FFVs – MC, LDV and LDTs).

For a local gasoline/diesel fleet example, the AVFT would exclude the CNG and E-85.

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction
21	2017	1	1	0.988254033
21	2017	2	1	0.011745961
21	2017	5	1	0
21	2017	9	30	0
21	2016	1	1	0.988254029
21	2016	2	1	0.011745961
21	2016	5	1	0
21	2016	9	30	0
21	2015	1	1	0.988254052
21	2015	2	1	0.011745961
21	2015	5	1	0
21	2015	9	30	0

Should Add up to 1.00

fueltypeid: 1, 2, 3, 5, 9 (gasoline, diesel, CNG, E-85, electricity [however fraction values = zero])

engtechID: 1, 30 (conventional internal combustion, electric)

MOVES Inputs – Fuels (Fuel Usage Fractions)

For FFVs provides the opportunity to split fuel use between gasoline and E-85

Sets the fraction of E-85 use among E-85 capable vehicles

For a local AVFT with only gasoline and diesel fleet (previous slide example), the MOVES default E-85 use fractions are ignored

countyID	fuelYearID	modelYear GroupID	sourceBinFuel TypeID	fuelSupplyFuel TypeID	usageFraction
48029	2010	0	1	1	1
48029	2010	0	2	2	1
48029	2010	0	3	3	1
48029	2010	0	4	4	1
48029	2010	0	5	1	1
48029	2010	0	5	5	0
48029	2010	0	9	9	1

MOVES Inputs – Met Conditions

Local temperature and relative humidity data are required for SIP and regional conformity analyses

Ambient temperature can have substantial effects on on-road vehicle emissions for most pollutant processes

Relative humidity is an important factor affecting NO_x emissions (lower NO_x from cooling effect, for both gasoline and diesel-powered vehicles)

Period average barometric pressure (inches Mercury) is another meteorological input (affecting relative humidity NO_x effects)

monthID	zoneID	hourID	temperature	relHumidity
7	480290	1	79.51	72.71
7	480290	2	78.29	75.84
7	480290	3	77.21	80.01
7	480290	4	76.41	82.58
7	480290	5	75.8	84.4
7	480290	6	75.29	86.43
7	480290	7	74.96	87.3
7	480290	8	75.55	86.49
7	480290	9	78.12	80.74
7	480290	10	81.08	72.45
7	480290	11	83.87	64.91
7	480290	12	86.95	55.15
7	480290	13	89.39	48.79
7	480290	14	91.24	44.69
7	480290	15	92.79	40.36
7	480290	16	93.87	38.42
7	480290	17	94.48	37.38
7	480290	18	94.24	37.4
7	480290	19	92.95	39.89
7	480290	20	91	43.52
7	480290	21	87.7	50.84
7	480290	22	85.02	57.12
7	480290	23	83.05	61.93
7	480290	24	81.07	68.18

MOVES Inputs – Met Conditions Cont'd

County table includes altitude information (H or L, for high versus low) and barometric pressure (inches Mercury, which could be processed from the same period weather data as zonemonthhour input data)

countyID	stateID	countyName	altitude	GPAFract	barometricPressure
48029	48	Bexar County	L	0	29.165
48091	48	Comal County	L	0	28.951
48187	48	Guadalupe County	L	0	29.287
48259	48	Kendall County	L	0	28.716
48493	48	Wilson County	L	0	29.383

MOVES Inputs – Control Programs

MOVES includes estimates for vehicle inspection and maintenance program effects on light-duty gasoline vehicle exhaust and evaporative emissions

Pollutants/processes that may be affected include exhaust start and running THC, CO, NO_x; and THC vapor venting

Passenger Car, Passenger Truck, and Light Commercial Truck are the targets

Harris County, Texas example 2018 summer weekday reductions: VOC 5.3/39.8 tons; NO_x 4.3/60 tons

MOVES **IMCOVERAGE** Input Parameters

- polProcessID (pollutant and emissions process affected by the program);
- stateID (state subject to the I/M program);
- countyID (FIPS county code);
- yearID (year administered);
- sourceTypeID (SUT covered);
- fuelTypeID (fuel type subject to the program – gasoline or E-85);
- IMProgramID (arbitrary ID number);
- begModelYearID (first model year covered);
- endModelYearID (last model year covered);
- inspectFreq (inspection frequency for the program);
- testStandardsID (I/M test type);
- useIMyn (a Y/N [yes/no] switch that specifies whether or not to use the record); and
- complianceFactor (an adjustment factor reducing the I/M effects for compliance rate, waiver rates, regulatory class adjustments, or other adjustments, if needed).

Summary

Data-Intensive

- Spend Resources on Most Critical Inputs
- Inventory Vs. Rate Mode Selection
- MYSQL Queries
- Changing Default Inputs (Refer EPA Guidance)

Resource-Intensive

- Runtime (Depends on Pollutant-Processes, Mode, Output Options, etc.)
- Inventory Vs. Rate Mode Selection
- Fast Computer & Large Hard-Drive Capacity
- Implement Errors Identification Procedures

Refer EPA Guidance Documents and Training Modules

Adjustment Factors

Rates Mode Run

MOVES Emission Rates- TxLED Adjustments

110 east Texas counties in the TxLED Program (includes the five AAMPO TDM counties, except for Kendall)

Typically statewide TxLED adjustment factors for diesel NOx emissions are estimated by SUT and analysis year are applied to all MOVES output diesel vehicle NOx emissions rates

Estimated TxLED NOx reductions vary between 4.8% (for 2002 and later model years and 6.2% (for pre-2002 model years) for aggregate rates (derived from EPA analysis accepted by TCEQ)

Diesel Fuel Source Use Type	Reduction			Adjustment		
	2020	2023	2026	2020	2023	2026
Passenger Car	4.92%	4.86%	4.84%	0.9508	0.9514	0.9516
Passenger Truck	5.01%	4.95%	4.94%	0.9499	0.9505	0.9506
Light Commercial Truck	5.21%	5.07%	5.00%	0.9479	0.9493	0.9500
Intercity Bus	5.61%	5.51%	5.39%	0.9439	0.9449	0.9461
Transit Bus	5.51%	5.40%	5.23%	0.9449	0.9460	0.9477
School Bus	5.57%	5.45%	5.30%	0.9443	0.9455	0.9470
Refuse Truck	5.24%	5.03%	4.93%	0.9476	0.9497	0.9507
Single Unit Short-Haul Truck	4.85%	4.83%	4.82%	0.9515	0.9517	0.9518
Single Unit Long-Haul Truck	4.86%	4.84%	4.83%	0.9514	0.9516	0.9517
Motor Home	5.29%	5.21%	5.16%	0.9471	0.9479	0.9484
Combination Short-Haul Truck	5.11%	4.98%	4.90%	0.9489	0.9502	0.9510
Combination Long-Haul Truck	5.12%	4.97%	4.88%	0.9488	0.9503	0.9512

OUTPUTS

Rates Mode Run

MOVES Emission Rates- Emission Process

Process (Process ID)	Activity	Emissions Rates	Energy Rates
Running Exhaust (1)	VMT	mass/mi	energy/mi
Crankcase Running Exhaust (15)	VMT	mass/mi	-
Brake Wear (9)	VMT	mass/mi	-
Tire Wear (10)	VMT	mass/mi	-
Start Exhaust (2)	Starts	mass/start	energy/start
Crankcase Start Exhaust (16)	Starts	mass/start	-
Extended Idle Exhaust (90)	SHI	mass/shi	energy/shi
Crankcase Extended Idle Exhaust (17)	SHI	mass/shi	-
Auxiliary Power Exhaust (91)	APU Hours	mass/apu hour	energy/apu hour
Evaporative Permeation (11) Evaporative Fuel Vapor Venting (12) Evaporative Fuel Leaks (13)	VMT, SHP	mass/mi, mass/shp	-
Refueling Displacement Vapor Loss (18)	VMT, Starts	mass/mi, mass/start	-
Refueling Spillage Loss (19)	VMT, Starts, SHI, APU Hours	mass/mi, mass/start, mass/shi, mass/apu	-

MOVES Emission Rates- Output

ProcessID	ProcessName	Rates/Distance	Rates/Vehicle	Rates/Profile	Rates/Start	Rates/Hour
1	Running Exhaust	X				
2	Start Exhaust		X		X	
9	Brakewear	X				
10	Tirewear	X				
11	Evap Permeation	X	X			
12	Evap Fuel Vapor Venting	X		X		
13	Evap Fuel Leaks	X	X			
15	Crankcase Running Exhaust	X				
16	Crankcase Start Exhaust		X		X	
17	Crankcase Extended Idle Exhaust		X			X
18	Refueling Displacement Vapor Loss	X	X			
19	Refueling Spillage Loss	X	X			
90	Extended Idle Exhaust		X			X
91	Auxiliary Power Exhaust		X			X

Summary- Rate Mode Run

Benefits

- Detailed link level estimates
- No rerun for same analysis year- activity changes
- Highly recommended for SIP
- More flexibility

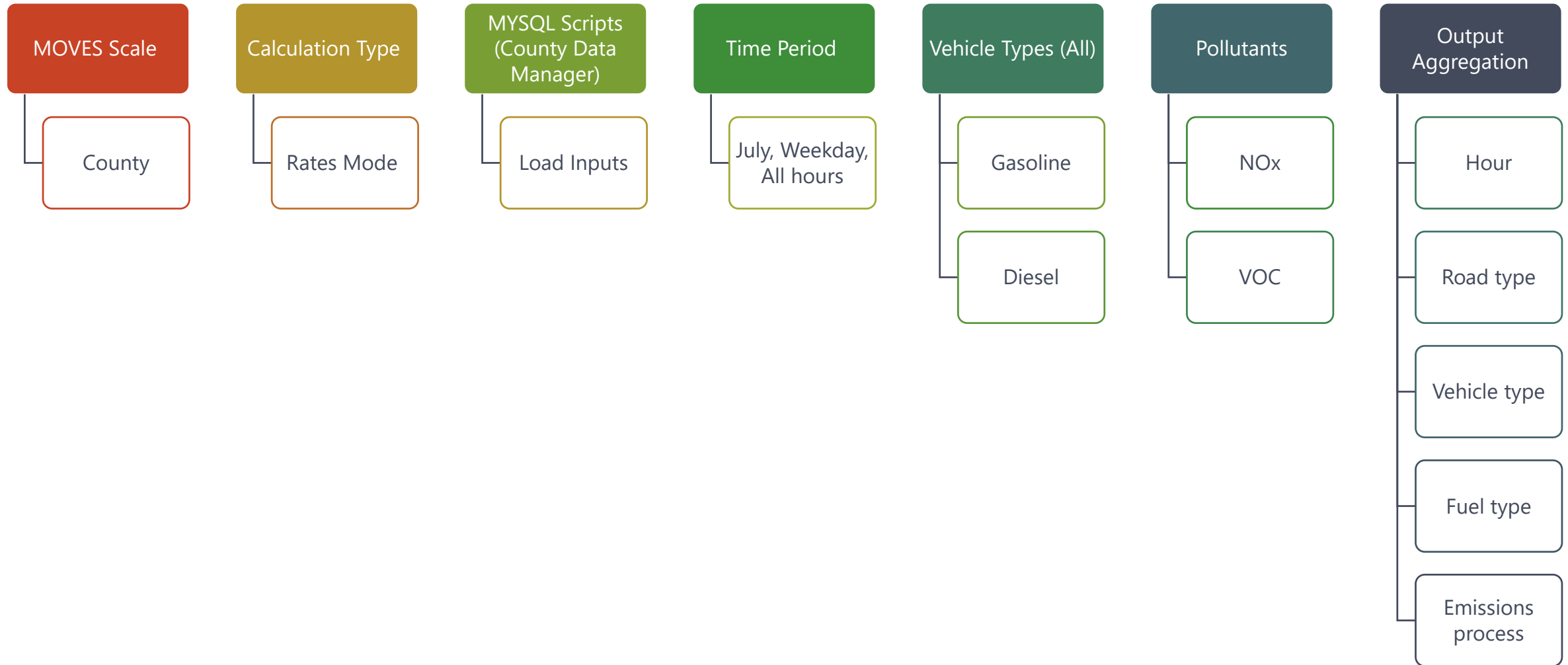
Limitations

- Long run time– need faster processing computers
- Post processing required
- Knowledge of MYSQL important

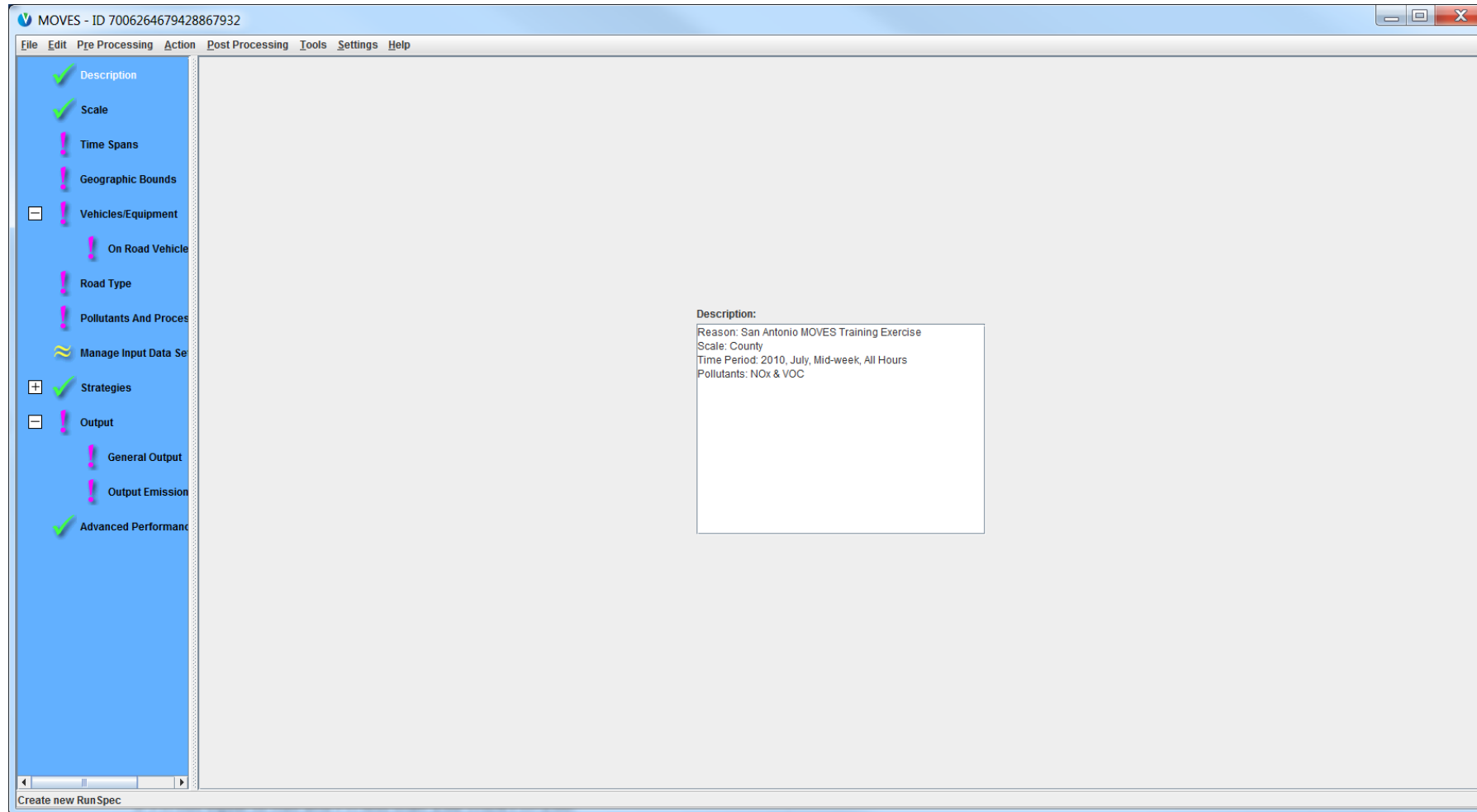


Hands On Exercise Rates Mode Run

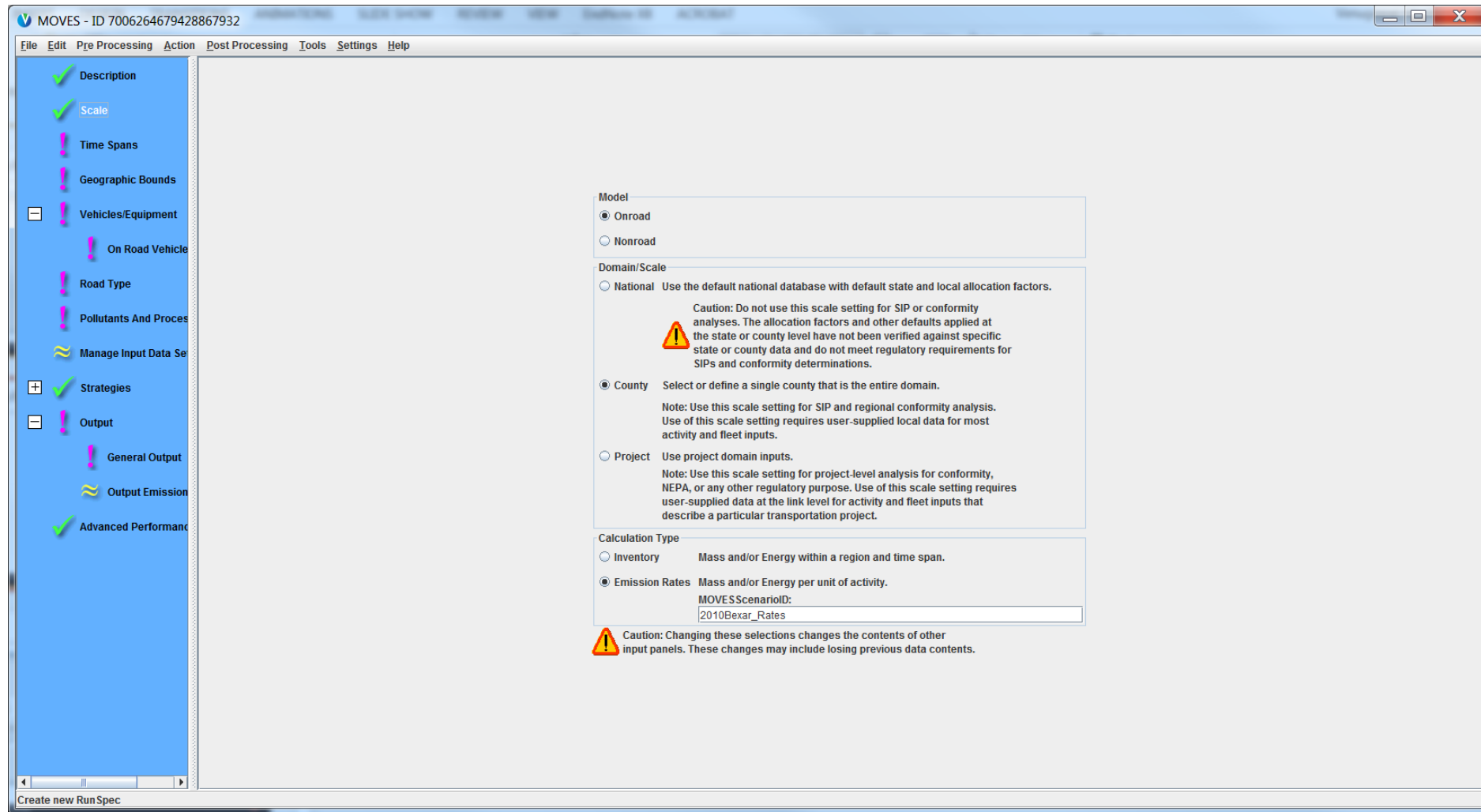
MOVES Modeling Elements



MOVES Rates Run: Description



MOVES Rates Run: Scale



MOVES Rates Run: Geographic

The screenshot displays the MOVES software interface with the title bar "MOVES - ID 7006264679428867932". The main window has a menu bar (File, Edit, Pre Processing, Action, Post Processing, Tools, Settings, Help) and a left sidebar with a tree view of configuration categories: Description, Scale, Time Spans, Geographic Bounds, Vehicles/Equipment, On Road Vehicle, Road Type, Pollutants And Proces, Manage Input Data Se, Strategies, Output, General Output, Output Emission, and Advanced Performance. The main area shows the "Geographic Bounds Requirements" section with the following fields:

- Region: ☐ Nation, ☐ State, ☐ County, ☒ Zone & Link, ☐ Custom Domain
- States: OKLAHOMA, OREGON, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, SOUTH DAKOTA, TENNESSEE, TEXAS
- Counties: (Empty list)
- Selections: TEXAS - Bexar County

Below these fields are buttons for "Select All", "Add", and "Delete". A yellow box highlights the "Domain Input Database" section, which contains the text "The County domain scale requires a database of detailed data." and fields for "Server: localhost" and "Database:" with "Refresh" and "Enter/Edit Data" buttons. Below this is a text box labeled "Please select a domain database.".

Overlaid on the bottom right is the "MOVES County Data Manager" dialog box. It has a tabbed interface with tabs for "Run Spec Summary", "Database", "Age Distribution", "Average Speed Distribution", "Fuel", and "Meteorology Data". The "Database" tab is active, showing the text "Select or create a database to hold the imported data." and fields for "Server: localhost" and "Database: 2010Bexar_Training_in", with "Refresh" and "Create Database" buttons. A "Log:" section is at the bottom, and a green bar at the very bottom is labeled "Database" with a "Done" button.

MOVES Rates Run: County Database Manager

MOVES County Data Manager

Hotelling I/M Programs Retrofit Data Generic Tools

Road Type Distribution Source Type Population Starts Vehicle Type VMT

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

sourceTypeAgeDistribution Data Source:

File: (please select a file) Browse...

Clear Imported Data Create Template...

Import

Age Distribution

Done

Open sourceTypeAgeDistribution Data

Look in: Exercise Files

Name	Date modified
HPMSVtypeYear	11/16/2017 3:58 PM
imcoverage	11/16/2017 3:59 PM
MonthVMTfraction	11/16/2017 3:59 PM
Roadtype	11/16/2017 4:00 PM
RoadtypeDistribution	11/16/2017 4:00 PM
Sourcetypeagedistribution	11/16/2017 4:01 PM
Sourcetypeyear	11/16/2017 4:01 PM
State	11/16/2017 4:01 PM
Year	11/16/2017 4:01 PM
Zone	11/16/2017 4:01 PM
Zonemonthhour	11/16/2017 4:02 PM
Zoneroadtype	11/16/2017 4:02 PM

File name: Sourcetypeagedistribution Open

Files of type: All Files (*.*) Cancel

MOVES County Data Manager

Hotelling I/M Programs Retrofit Data Generic Tools

Road Type Distribution Source Type Population Starts Vehicle Type VMT

RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

sourceTypeAgeDistribution Data Source:

File: Sourcetypeagedistribution.csv Browse...

CSV

Clear Imported Data Create Template...

Import

Messages:

SourceTypeAgeDistribution imported.
Import complete.

Export Imported Data

Age Distribution

Done

MOVES Rates Run: County Database Manager Cont'd

The screenshot displays the 'MOVES County Data Manager' application window. The top menu bar includes 'Hotelling', 'I/M Programs', 'Retrofit Data', 'Generic', 'Tools', 'Road Type Distribution', 'Source Type Population', 'Starts', 'Vehicle Type VMT', 'RunSpec Summary', 'Database', 'Age Distribution', 'Average Speed Distribution', 'Fuel', and 'Meteorology Data'. The 'Fuel' menu item is selected. Below the menu bar, there is a 'Description of Imported Data:' section with a text area and a 'Fuels Wizard' button. The main area shows two rows of data for 'AVFT Data Source:'. The first row is labeled 'CSV' and has buttons for 'Clear Imported Data' and 'Create Template...'. The second row is also labeled 'CSV' and has the same buttons. Below this, there is a 'Browse...' button. At the bottom of the main area, there is an 'Import' button. The 'Messages:' section at the bottom left contains the following text: 'FuelSupply imported.', 'FuelFormulation imported.', 'FuelUsageFraction imported.', 'avft imported.', 'Warning: Fuel type 1 is imported but will not be used', 'Warning: Fuel type 2 is imported but will not be used', and 'Import complete.'. At the bottom of the window, there are two buttons: 'Export Default Data' and 'Export Imported Data'. A pink bar at the bottom right of the window contains the text 'Fuel' and a 'Done' button.

MOVES County Data Manager

Hotelling I/M Programs Retrofit Data Generic Tools
Road Type Distribution Source Type Population Starts Vehicle Type VMT
RunSpec Summary Database Age Distribution Average Speed Distribution Fuel Meteorology Data

Description of Imported Data:

Fuels Wizard

CSV Clear Imported Data Create Template...

AVFT Data Source:

File: avft.csv Browse...

CSV Clear Imported Data Create Template...

Import

Messages:

FuelSupply imported.
FuelFormulation imported.
FuelUsageFraction imported.
avft imported.
Warning: Fuel type 1 is imported but will not be used
Warning: Fuel type 2 is imported but will not be used
Import complete.

Export Default Data Export Imported Data

Fuel Done

MOVES Rates Run: Vehicle Types & Fuel

MOVES - ID 7006264679428867932

File Edit Pre Processing Action Post Processing Tools Settings Help

☒ Description
☒ Scale
☒ Time Spans
☒ Geographic Bounds
☐ ☒ Vehicles/Equipment
☒ On Road Vehicle
☒ Road Type
☒ Pollutants And Processes
☒ Manage Input Data Set
☒ Strategies
☐ ☒ Output
☒ General Output
☒ Output Emission
☒ Advanced Performance

Fuels:
Compressed Natural Gas (CNG)
Diesel Fuel
Electricity
Ethanol (E-85)
Gasoline

Source Use Types:
Combination Long-haul Truck
Combination Short-haul Truck
Intercity Bus
Light Commercial Truck
Motor Home
Motorcycle
Passenger Car
Passenger Truck
Refuse Truck
School Bus
Single Unit Long-haul Truck
Single Unit Short-haul Truck
Transit Bus

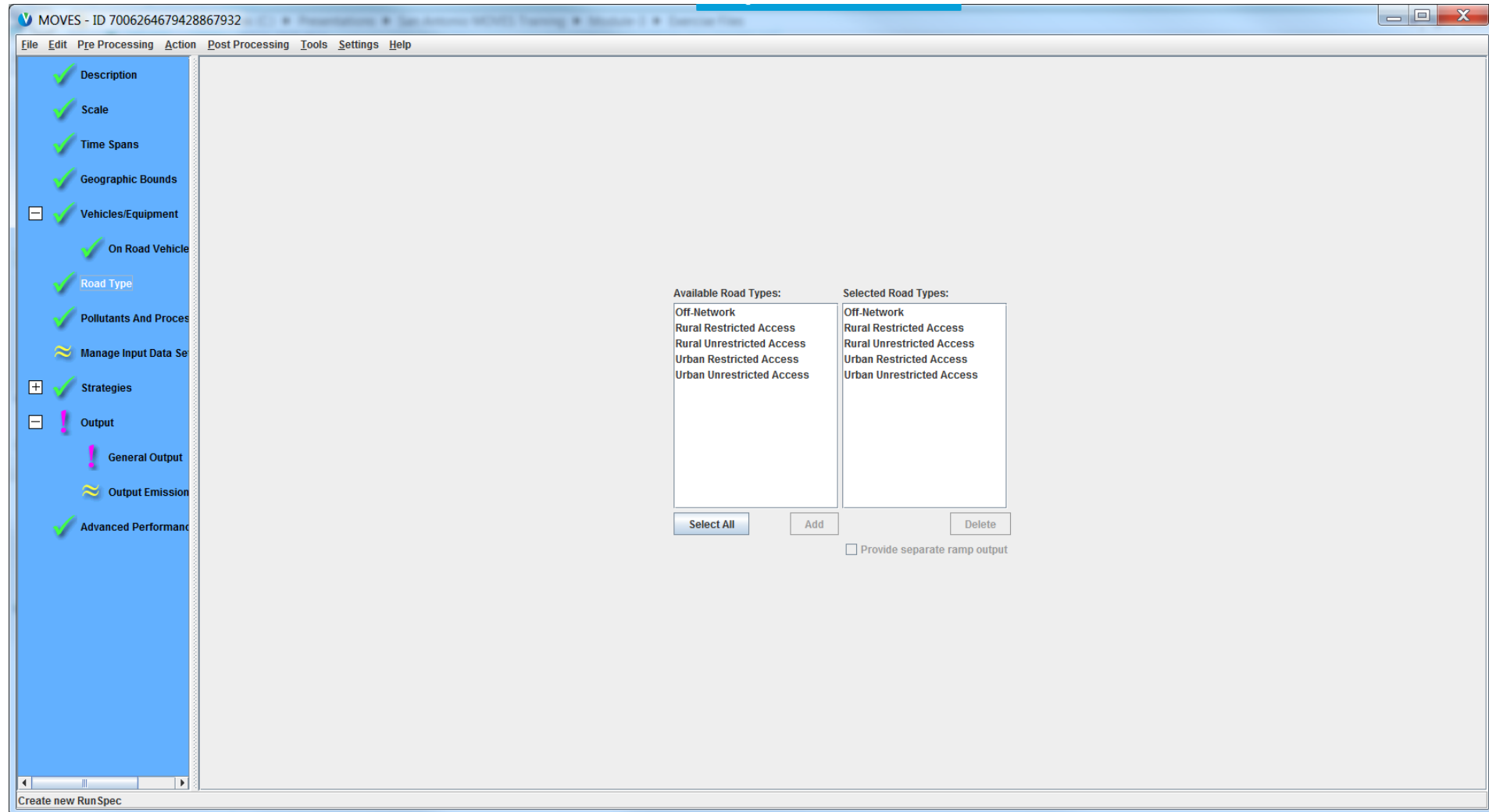
Selections:
Diesel Fuel - Combination Long-haul Truck
Diesel Fuel - Combination Short-haul Truck
Diesel Fuel - Intercity Bus
Diesel Fuel - Light Commercial Truck
Diesel Fuel - Motor Home
Diesel Fuel - Passenger Car
Diesel Fuel - Passenger Truck
Diesel Fuel - Refuse Truck
Diesel Fuel - School Bus
Diesel Fuel - Single Unit Long-haul Truck
Diesel Fuel - Single Unit Short-haul Truck
Diesel Fuel - Transit Bus
Gasoline - Combination Short-haul Truck
Gasoline - Light Commercial Truck
Gasoline - Motor Home
Gasoline - Motorcycle
Gasoline - Passenger Car
Gasoline - Passenger Truck
Gasoline - Refuse Truck
Gasoline - School Bus
Gasoline - Single Unit Long-haul Truck
Gasoline - Single Unit Short-haul Truck
Gasoline - Transit Bus

Select All Select All Delete

Add Fuel/Type Combinations

Create new RunSpec

MOVES Rates Run: Roadway Types



MOVES Rates Run: Pollutant & Processes

MOVES - ID 7006264679428867932

File Edit Pre Processing Action Post Processing Tools Settings Help

☒ Description
☒ Scale
☒ Time Spans
☒ Geographic Bounds
☐ Vehicles/Equipment
☒ On Road Vehicle
☒ Road Type
☒ Pollutants And Processes
☒ Manage Input Data Set
☒ Strategies
☐ Output
☒ General Output
☒ Output Emission
☒ Advanced Performance

	Running Exhaust	Start Exhaust	Brakewear	Tirewear	Evap Permeation	Evap Fuel Vapor Venting	Evap Fuel Leaks	Crankcase Running Exhaust	Crankcase Start Exhaust	Crankcase Extended Idle Exhaust	Refi
<input checked="" type="checkbox"/> Total Gaseous Hydrocarbons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Non-Methane Hydrocarbons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Non-Methane Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Total Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Volatile Organic Compounds	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Methane (CH4)	<input type="checkbox"/>	<input type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Carbon Monoxide (CO)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Oxides of Nitrogen (NOx)	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Nitrogen Oxide (NO)	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Nitrogen Dioxide (NO2)	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Nitrous Acid (HONO)	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Ammonia (NH3)	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Nitrous Oxide (N2O)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Primary Exhaust PM2.5 - Total	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> (+) Primary Exhaust PM2.5 - Species	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM2.5 - Brakewear Particulate			<input type="checkbox"/>								
<input type="checkbox"/> Primary PM2.5 - Tirewear Particulate				<input type="checkbox"/>							
<input type="checkbox"/> Primary Exhaust PM10 - Total	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM10 - Brakewear Particulate			<input type="checkbox"/>								
<input type="checkbox"/> Primary PM10 - Tirewear Particulate				<input type="checkbox"/>							
<input type="checkbox"/> Sulfur Dioxide (SO2)	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Total Energy Consumption	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>									
<input type="checkbox"/> Petroleum Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>									
<input type="checkbox"/> Fossil Fuel Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>									
<input checked="" type="checkbox"/> Atmospheric CO2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>									
<input type="checkbox"/> CO2 Equivalent	<input type="checkbox"/>	<input type="checkbox"/>									
<input type="checkbox"/> Benzene	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Ethanol	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> MTBE	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> 1,3-Butadiene	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Formaldehyde	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Acetaldehyde	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Acrolein	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> (+) Additional Air Toxics	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> (+) Polycyclic Aromatic Hydrocarbons (PAH)	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> (+) Metals	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> (+) Dioxins and Furans	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> CB05 Mechanism	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> CB06 Mechanism	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Create new Run Spec

MOVES Rates Run: Output

MOVES - ID 7006264679428867932

File Edit Pre Processing Action Post Processing Tools Settings Help

- ✓ Description
- ✓ Scale
- ✓ Time Spans
- ✓ Geographic Bounds
- [-] ✓ Vehicles/Equipment
 - ✓ On Road Vehicle
- ✓ Road Type
- ✓ Pollutants And Proces
- ✓ Manage Input Data Se
- [-] ✓ Strategies
 - ✓ Rate Of Progres
- [-] ✓ Output
 - ✓ General Output
 - ✓ Output Emission
 - ✓ Advanced Performance

Output Database

Server: Refresh

Database: 2010Bexar_training_out Create Database...

Units

Mass Units: Grams

Energy Units: Joules

Distance Units: Miles

Activity

- ☒ Distance Traveled
- ☐ Source Hours
- ☒ Hotelling Hours
- ☐ Source Hours Operating
- ☐ Source Hours Parked
- ☒ Population
- ☒ Starts

Create new RunSpec

MOVES Rates Run: Output Preferences

The screenshot shows the MOVES application window with the title bar "MOVES - ID 7006264679428867932". The menu bar includes File, Edit, Pre Processing, Action, Post Processing, Tools, Settings, and Help. On the left, a tree view shows various categories with green checkmarks indicating they are selected or completed. The "Output" category is expanded, showing "General Output", "Output Emission", and "Advanced Performance". The main area displays the "Output Preferences" dialog with several sections of checkboxes and dropdown menus.

Always

- ☒ Time (Hour)
- ☒ Location (LINK)
- ☒ Pollutant

for All Vehicle/Equipment Categories

- ☐ Model Year
- ☒ Fuel Type ☐ Fuel Subtype
- ☒ Emission Process
- ☐ Estimate Uncertainty

On Road/Off Road

- ☒ On Road/Off Road

On and Off Road

- ☒ Road Type
- ☒ Source Use Type
- ☐ SCC
- ☐ Regulatory Class

Off Road

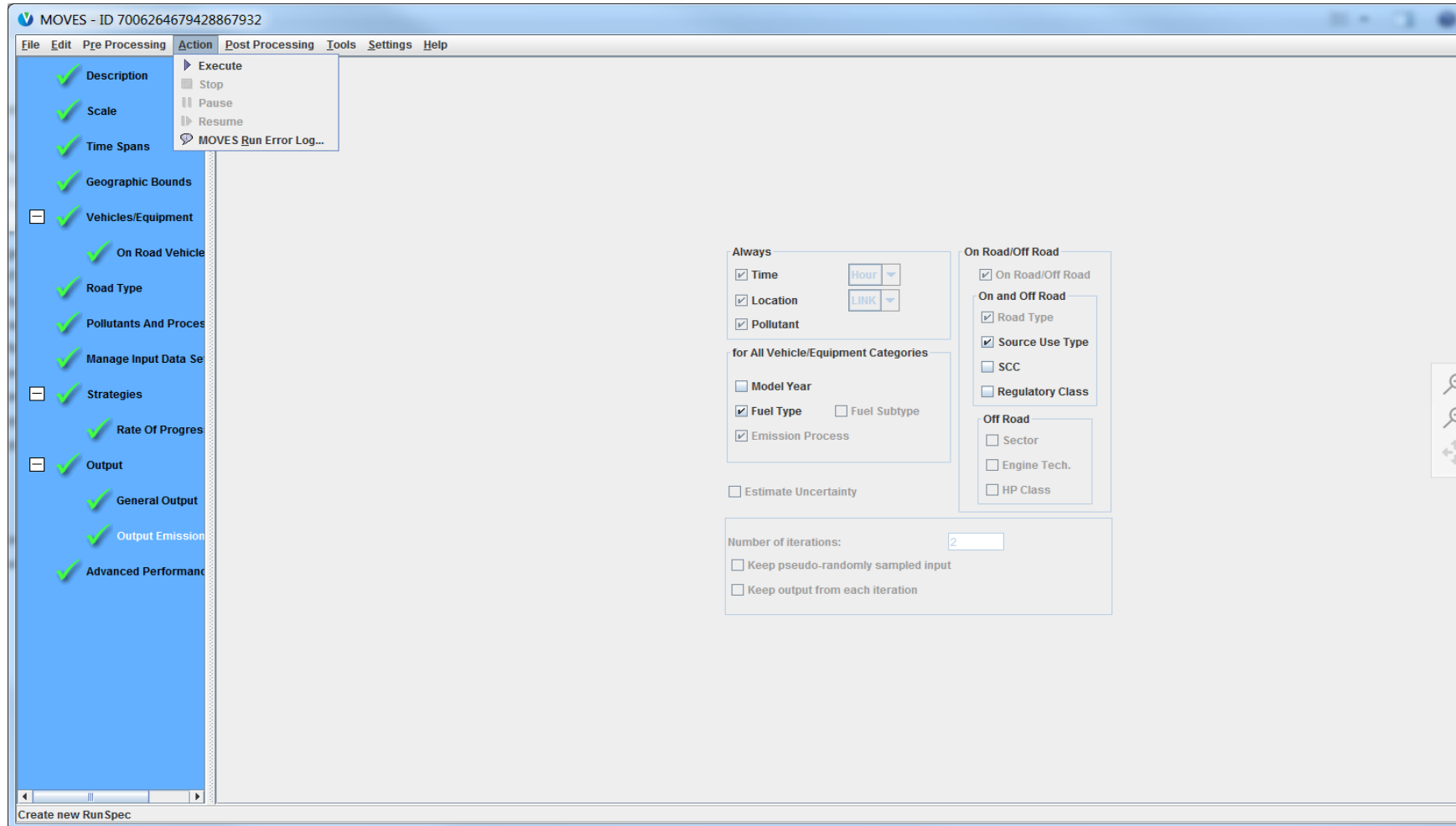
- ☐ Sector
- ☐ Engine Tech.
- ☐ HP Class

Number of iterations: 2

- ☐ Keep pseudo-randomly sampled input
- ☐ Keep output from each iteration

Create new RunSpec

MOVES Rates Run: Execution



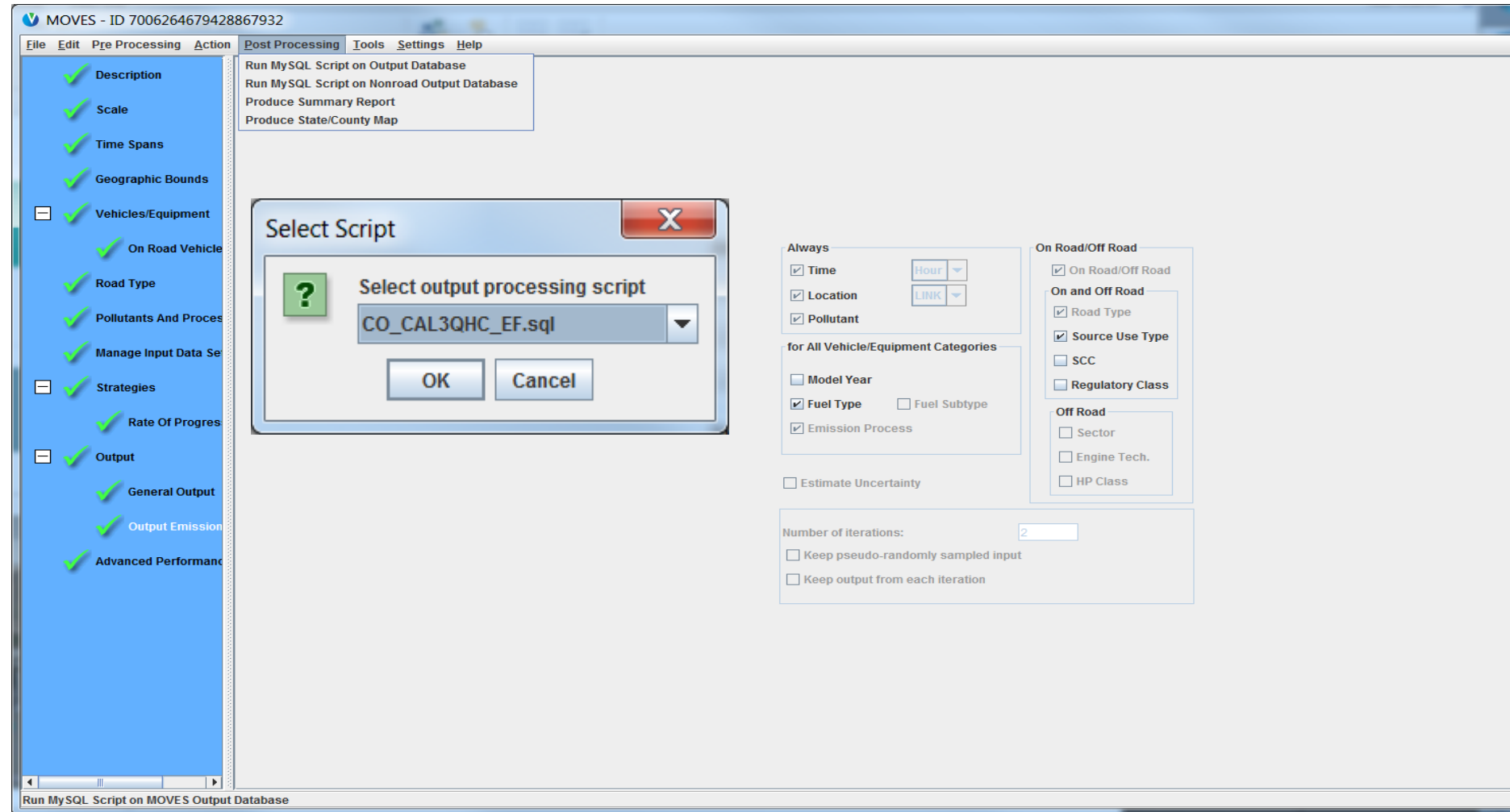
MOVES Running



!!!! Done for The day !!!

Lets Check Run Results Tomorrow

Results



Resources

- EPA, Guidance Documents
 - <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100NN9L.txt>
- TCEQ, Onroad Emissions
 - https://www.tceq.texas.gov/airquality/mobilesource/mobile_source.html
- TWG Air Quality Portal
 - <http://txaqportal.org/PolicyAnalysis.aspx>